

# Evolution of Crop Disease Detection Using Machine Learning

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**Abstract:** Crop disease detection system focuses on providing the information about the crop disease prediction, pesticide recommendation and the amount of pesticide or chemicals to be used for an unhealthy crop. The user, who is the Farmer clicks a picture of the unhealthy crop and uploads it to the server by using the android application installed in mobile or by using webpage. After uploading the image the farmer clicks the Predict button which is displayed over screen. Then uploaded image is processed and accordingly the features of that image are extracted from it. Based on these features, classification of image is done using Convolutional neural network and the classes having maximum probability is selected for further process. Then the result consisting of the disease name is retrieved and shown to the user. This result is then uploaded into the message table in the server and retrieved in mobile application or on the webpage where corresponding information such as pesticide name, amount of pesticide to be used and organic pesticides which are stored. Now the Farmer will be able to retrieve the complete information in a presentable, readable format on the screen of the Application.

**Keywords:** Pesticide, classification, Extraction, Convolutional neural Networks

## I. INTRODUCTION

The primary occupation in India is farming. India ranks second position in the agricultural output in worldwide. Here in India, farmers cultivate a great diversity of crops. Variety of factors such as climatic conditions, soil conditions, various disease, etc affect the productivity of the crops. The existing system for crop disease detection is simply naked eye observation which requires more man labor, properly equipped laboratories, expensive systems, etc. And improper disease detection may led to inexperienced pesticide usage that can cause in development of long term resistance of the pathogens, reducing the ability of the crop to fight back. The plant disease detection can be done by observing the spot on the leaves of the affected plant. The method we are adopting to detect plant diseases is image processing using Convolution Neural Network (CNN).

The first implementation of the plant disease detection using image processing was done by Shen WeizhegWuyachun Chen Zhanliang and Wi Hangda in their paper. To notice the crop wellness we've studied several algorithms, it concerned AN application of Convolutional Neural Networks (CNN) with a custom-built design, within the plant disease from there leaves, as well as VGG design with sixteen and nineteen layers (VGG sixteen and VGG 19), is projected to classify the leaves of Tomato Plants, infected with varied diseases as well as microorganism Spot, Early Blight, blight, Septoria leaf spot, Spider mites, Mosaic virus, leaf mold, target spot and tomato yellow leaf curl unwellness. VGG design, uses three X three Convolutional layers stacked on the highest of every alternative within the manner of their depth in increasing pattern.

The smaller Networks that are converged then it's used for initialisation of larger deep networks, it's called pertaining. There are 2 major drawbacks of VGGNet, 1. it's terribly slow to coach 2. there's an outsized quantity of spec weights in terms of disk/bandwidth. to beat the disadvantage of VGG, and to scale back the error rate ResNet comes into image. it's a mistake rate of 3.57 proportion on the ImageNet Dataset just like VGG, ResNet conjointly contains the many layers stacked on one another. At the top of these layers network learnness ever allow/mid/high level features. Residuals are often nothing however subtraction of feature learned from every input layer. This means that coaching of this kind of network is simpler than the opposite sort of networks and conjointly solves the matter of error rate because it decreases the error rate.

## II. REVIEW OF LITERATURE SURVEY

Agricultural Crop Yield Prediction Using Artificial Neural Network Approach Author: Raorane A.A., Kulkarni R.V. This system which can predict the more accuracy using meteorological data. Nowadays, there are a lot of yield prediction

models, that more of them have been generally classified in two group: 1) Statistical Models, 2) Crop Simulation Models of Artificial Intelligence

Data Mining: An effective tool for yield estimation in the agricultural sector Author: Raorane A.A., Kulkarni R.V. This application research aimed to assess these new data mining techniques and apply them to the various variables consisting in the database to establish if meaningful relationships can be found.

Analysis of crop yield prediction using data mining techniques Author: D Ramesh 1, B Vishnu Vardhan This paper presents a brief analysis of crop yield prediction using Multiple Linear Regression (MLR) technique and Density based clustering technique for the selected region i.e. East Godavari district of Andhra Pradesh in India. Crop yield prediction using time series Models Authors: Askar Choudhury, Illinois State University James Jones, Illinois State University

The results of this study indicate that the ARMA model is preferable over other time series models considered in this paper. The implication of the findings in this study is significant for insurance underwriters responsible for constructing area-based yield insurance that can benefit the Micro insurance market of smallholder farmers and for institutions that rely on those forecasts in providing capital. Crop and Yield Prediction Model Authors: Shreya Bhanose, Kalyani Bogawar, Aarti Dhotre, Bhagyashree R. Gaidhani This paper proposes Bee Hive algorithm for predicting crop yield from historical data set. Algorithm handles large data set but it has drawback of having number of tunable parameters and k value.

**III. PROPOSED SYSTEM**

In this system it can help farmers to induce best crops. this method gives output after analysing all necessary attribute like rain, soil condition, temperature, cost, market price, etc. this method provide result to farmers for recommendation of best crops. This will be based totally on user location and on multiple factors like humidity, water availability, weather status, soil condition, acidity of soil, etc. In the proposed system initially the photographs are get from the farmer. The photographs are received from the farmer via the Android Application for service of the farmer. The acceptable image of the leaf captured. Then image is going to be resized in proper format then it'll be uploaded on server on which an algorithm is implemented using Convolutional Neural Network. The CNN (Convolutional Neural Network) architecture split into two parts first is feature extraction and second is classification and has four main components. The overall system design consists of following components:

- a) Convolutional operation.
- b) Max-pooling (Down sampling)
- c) ReLu (Non Linearity)
- d) Classification (fully connected layer)

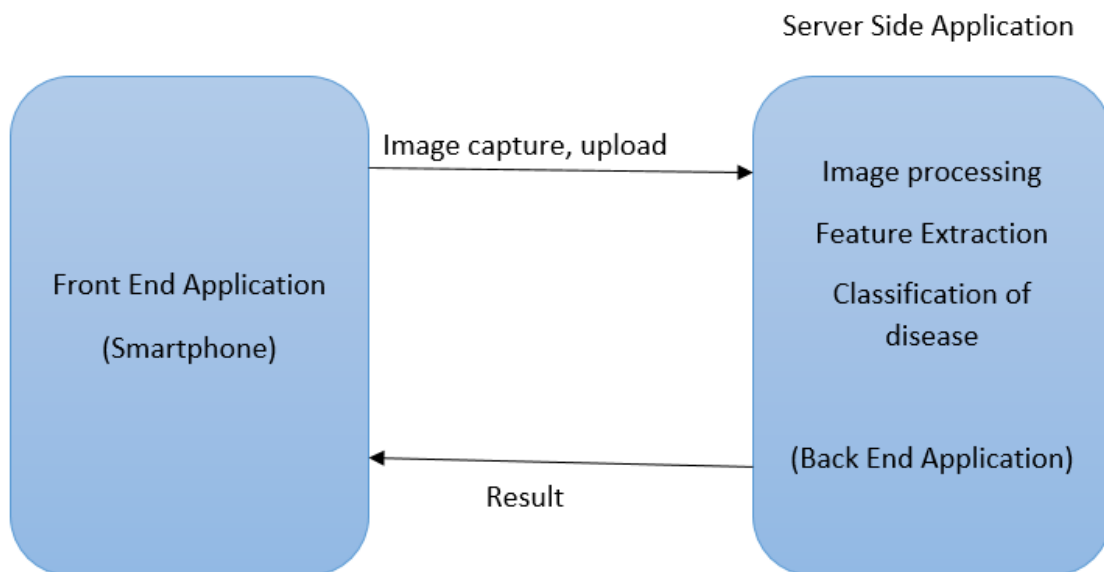


Fig. 1 System Architecture

As soon as image is reached to server it's processed with Algorithm here it can extract the feature of image with convolutional operation by convolving the filter over image which produces the feature maps like edges, texture, spots, holes, colour. These features maps are down sampled in order that it will be passed to totally connected layer i.e. classifier after each layer we apply ReLu i.e. non linearity so it can solve complex problem like classification. Then these maps are

flattened and given to totally connected layer where it's classified into the various classes of diseases and return with the name of Disease which has highest probability and corresponding pesticides are remand to the applying. Where it's converted into proper format and displayed on the screen of user.

#### **IV. METHODOLOGY**

System consists of following methods:

- a) Data preprocessing: all the pictures in dataset are resized to 100x100 pixel format.
- b) Data is split into two parts 80 percent training set, 20 percent test set.
- c) Data augmentation: augmentation process is applied of Training set to rotate, resize and adding some random noise to photographs so as to avoid over fitting.
- d) Feature extraction: Features would be extracted in starting layers of CNN architecture using convolutional operation.
- e) Training the model: Once architecture is developed we are going to train the model with Training set features.
- f) Evaluation: Accuracy of model would be evaluated with the assistance of Test set.
- g) Tuning: If results don't seem to be satisfactory tune the model by changing the parameters of architecture like kernel size, Nodes in last fully connected layer.
- h) Store the weights: final model which has trained reserve it in configuration file so it will be used for brand spanking new data.
- i) Application android: application would be developed using java for android to upload images on server and display the results.
- j) Server Side application: this application answerable for preprocessing the image uploaded by user and classify it supported its features and provides the leads to the shape of JSON objects.
- k) Capture image, resize image and upload to the server.
- l) Extract the features and evaluate with trained model.
- m) Sending back the results to application.
- n) Display the results on smartphone.

##### *A. Crop Yield Prediction*

From very very long time agriculture has been main culture in India. In India people don't have awareness about the cultivation of crops in a very right time and at right place. By analyzing the parameters like temperature, weather and a number of other soil related parameters like soil ph value, water availability within the region, etc. during this paper proposes an inspiration to spot the suitability of crops for a selected soil which relies on the parameters mentioned above. During this paper, we'll use convolutional neural network approach within which accuracy will be maintained.

##### *B. Crop Disease Detection*

Crop disease detection is one among the a part of our android application after Crop yield prediction. This part is beneficial in detecting from which disease crop is littered with. In time period, analysis and monitoring were done manually, thus it won't to take lot of your time and work. Detection of disease may be done successfully with the assistance of image processing techniques and algorithms. It minimize the lot of labor from farmer side. Detection of disease within the early stage is incredibly much useful, because if disease persists then it'd destroy whole agricultural field. Detection of disease through some automatic technique is efficacious because it reduces an outsized work of monitoring in farms of crops. Existing System: In Existing system farmers not connected with any technology and survey. Farmer uses "trial and error" method for the standard system. Farmer evaluation onto land with different crops, water availability, etc. and after many such "tries", farmer probably gets the simplest crop suitable particularly land.

##### *C. Disadvantages of existing system*

High risk of your time and money loss. When growing new crops, farmers may face the risks of either market failure or manufacture problems.

#### **V. CONCLUSION**

This system tends to projected Crop sickness Detection exploitation CNN system supported Deep Learning. The delineated system will be by farmers because it offers the moment information regarding the crop sickness. It additionally reduces the Outbreaks, upsurges that causes the massive losses to crops and pastures and threatening the livelihoods of vulnerable farmers. As scrutiny with ancient crop sickness detection system, the delineated system offers the accuracy rate of 89 percentage which suggests correct detection of nine crop pictures from set of ten. The experimental results demonstrate the effectiveness of our projected system and it will be used wide by Farmers to discover the crop sickness.



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